zirconium dioxide, tantalum pentoxide, and tin oxide.--

REMARKS

Claims 1-34 remain pending in this application for which applicants seek reconsideration.

Amendment

Claims 1-34 have been amended in light of the examiner's § 112 rejection (see below) to more clearly recite the present invention and to improve their form and readability. No new matter has been introduced.

§ 112 Rejection

The examiner rejected claims 1-34 under 35 U.S.C. § 112, second paragraph, on numerous grounds as set forth in paragraphs 4-7 of the Detailed Action. Applicants traverse this rejection.

First, referring to paragraph 4 of the Detailed Action, the examiner alleges that not specifying the property of the article makes the claim indefinite. The claims recite a structure of the substrate for LCD elements. In this regard, it is not clear how the property of the article comes into play unless it is needed to further distinguish over prior art. The examiner is urged to study MPEP § 2173.04, where it specifically states that breadth of a claim is not to be equated with indefiniteness. The examiner is requested to fully identify the allegedly missing property of the article and how that property specifically makes the claims indefinite should this rejection be maintained.

Second, referring to paragraph 5 of the Detailed Action, the examiner alleges that reflectance depends upon wavelength and that the passage "reflectance in a visible light region" is indefinite. Applicants traverse because the visible light region falls within a specific wavelength range. Is the examiner requiring applicants to recite the range of wavelengths? As this rejection appears to be rather ambiguous, applicants urge the examiner to fully explain how this passage is indefinite should this rejection be maintained.

Accordingly, the light reflectance of a reflector comprised of a multilayer film is determined by all of the films constituting the multilayer film, not just the first surface.

Art Rejection

Claims 1 and 3-34 were rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over McCurdy (USP 5,935,716). Claim 2 was rejected under § 103(a) as unpatentable over McCurdy in view of Liu (USP 6,208,466). Finally, claims 1 and 3-34 were rejected under § 103(a) as unpatentable over Demiryont (USP 5,245,468). Applicants traverse these rejections because the applied references 1) do not teach a substrate for LCD elements and 2) do not teach the claimed reflector feature.

First, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. See MPEP § 2131. Claim 1 calls for a substrate for LCD elements. Neither McCurdy nor Demiryont discloses such a substrate for LCD elements. Rather, McCurdy discloses an anti-reflective coating for a glass substrate. Demiroyont similarly discloses an anti-reflective coating for a glass substrate, such as automotive and architectural windows, that is substantially transparent to visible light wavelengths. Based on the fact that neither McCurdy nor Demiroyont identifies a substrate for LCD elements, these references would not have anticipated the pending claims within the meaning of § 102. As to obviousness, applicants submit that it would not have been obvious to apply McCurdy's and Demiryont's coatings to a substrate for LCD elements as the purpose and the environment are vastly different. See below.

Second, claim 1 further calls for a transparent substrate and a reflector on the transparent substrate. In this respect, by the way of background, a semi-transparent reflector of a substrate of LCD elements allows the LDC elements to be used both as a reflective type in a bright environment and a transparent type using back lighting in a dark environment. The semi-transparent reflector is formed of an extremely thin metallic film, so thin that light can partially transmit. The metallic film is also made thin to suppress reflection and increase the degree of light transmittance. This requires a high degree of control during the manufacturing process,

making it difficult and expensive to manufacture them. Even with the extremely thin metallic film, light can be absorbed during transmission, reducing the light utilization factor. Further, when the liquid crystal is driven, capacitance develops between the metallic film and transparent electrodes (conductive films). This can induce signal delays, slowing down the speed of the drive signal for driving the LCD elements. The present invention was developed to overcome these disadvantages.

In this respect, the present invention uses a reflector comprising at least one pair of a first film having a high refractive index and a second film having a low refractive index stacked on the first film. Each of the first and second films is composed of a dielectric material. The first film has a refractive index of light of not less than 1.8 and the second film has a refractive index of light of not more than 1.5 at the wavelength of 550 nm. The film thickness of each of the first and second films is set so that the light reflectance in a visible light region of each of the first and second films falls within a range of 5 - 95%. In other words, claim 1 calls for achieving a desired light transmittance and light reflectance by controlling the number of pairs of high and low refractive index films and the thickness of each film. Neither McCurdy nor Demiryont discloses or teaches this aspect of the invention.

Specifically, McCurdy and Demiryont disclose a multilayered anti-reflective coating for a glass substrate. The examiner also states that Demiryont discloses numerous anti-reflective coatings, many of which use a film stack. Again, what Demiryont discloses is an anti-reflective coating. While these references disclose applying two different types of coatings, nonetheless, they do not disclose or suggest stacking a number of sets of those coatings, let alone controlling the thickness of each coating based on the number of stacked sets of those coatings and desired reflectance. Indeed, their coatings are not a reflector that allows LDC elements to be used both as a reflective type in a bright environment and a transparent type with back lighting. Because this aspect of the invention is not disclosed or taught, McCurdy and Demiryont would not have anticipated or rendered obvious claim 1. There simply would not have been any motivation for McCurdy and Demiryont to do what the present claim calls for.

Regarding claim 2, the examiner applied Liu for the proposition that it would have been

obvious for McCurdy to include a scattering layer. Even if the combination were deemed proper, Liu would not have alleviated McCurdy's shortcomings noted above. Accordingly, claim 1 still patentably distinguishes over this combination.

Conclusion

Applicants submit that claims 1-34 patentably distinguish over the applied references within the meaning of § 102 and § 103, and thus urge the examiner to issue an early Notice of Allowance. Should the examiner have any issues concerning this reply or any other outstanding issues remaining in this application, applicants urge the examiner to contact the undersigned.

Petition for Time Extension & Claim Fee

Applicants request a one-month extension, from July 1, 2002 to August 1, 2002, for replying to the outstanding Office Action. A check in the amount of $110 is enclosed. The Commissioner is authorized to charge any deficiency in fees or any additional fees required to maintain the pendency of this application to Deposit Account No. 18-2056.

Respectfully submitted,

Date: 07/12/02

Marc A. Rossi
Registration No. 31,923

ROSSI & ASSOCIATES
P.O. Box 826
Ashburn, VA 20146-0826
Phone: 703-726-6020

ATTACHMENT

MARKED UP VERSION

IN THE CLAIMS:

Claims 1 and 3-34 have been amended as follows:

--1. (Amended) A substrate for liquid crystal display elements, comprising:

a transparent substrate; and

a reflector comprising a predetermined number of pairs of a first [transparent] film having a high refractive index and a second [transparent] film having a low refractive index, each of said first and second films being composed of a dielectric material, and stacked on said transparent substrate[;],

wherein [:] said first [transparent] film has a refractive index of light of not less than 1.8 at a wavelength of 550 nm, and said second [transparent] film is stacked on said first [transparent] film, said second [transparent] film having a refractive index of light of not more than 1.5 at the wavelength of 550 nm;

wherein said predetermined number is an integer not less than 1[;] and

[said first transparent film and said second transparent film each have] a film thickness [thereof] of each of said first and second films is set to [such] a value [that] in which the light reflectance in a visible light region of each of said first and second [transparent] films [is] falls within a range of 5 - 95%.--

--3. (Twice Amended) A substrate for liquid crystal display elements as claimed in claim 1, wherein said light reflectance in the visible light region of each of said first and second [transparent] films is in a range of not less than 5% but less than 25%.

4. (Amended) A substrate for liquid crystal display elements as claimed in claim 3, wherein when said predetermined number is 1, said first [transparent] film has a film thickness of 20 - 130 nm, and said second [transparent] film has a film thickness of 50 - 110 nm.

12. (Amended) A substrate for liquid crystal display elements as claimed in claim 8, wherein when said predetermined number is 4, said first [transparent] film has a film thickness of 20 - 110 nm, and said second [transparent] film has a film thickness of 5 - 100 nm.

13. (Amended) A substrate for liquid crystal display elements as claimed in claim 8, wherein when said predetermined number is 5, said first [transparent] film has a film thickness of 10 - 110 nm, and said second [transparent] film has a film thickness of 5 - 110 nm.

14. (Amended) A substrate for liquid crystal display elements as claimed in claim 8, wherein when said predetermined number is 6, said first [transparent] film has a film thickness of 10 - 80 nm, and said second [transparent] film has a film thickness of 30 - 100 nm.

15. (Twice Amended) A substrate for liquid crystal display elements as claimed in claim 1, wherein said light reflectance in the visible light region of each of said first and second [transparent] films is in a range of not less than 45% but less than 65%.

16. (Amended) A substrate for liquid crystal display elements as claimed in claim 15, wherein when said predetermined number is 2, said first [transparent] film has a film thickness of 60 - 180 nm, and said second [transparent] film has a film thickness of 40 - 90 nm.

17. (Amended) A substrate for liquid crystal display elements as claimed in claim 15, wherein when said predetermined number is 3, said first [transparent] film has a film thickness of 20 - 160 nm, and said second [transparent] film has a film thickness of 10 - 150 nm.

18. (Amended) A substrate for liquid crystal display elements as claimed in claim 15, wherein when said predetermined number is 4, said first [transparent] film has a film thickness of 20 - 180 nm, and said second [transparent] film has a film thickness of 10 - 110 nm.

26. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 4, said first [transparent] film has a film thickness of 60 - 140 nm, and said second [transparent] film has a film thickness of 40 - 100 nm.

27. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 5, said first [transparent] film has a film thickness of 30 - 130 nm, and said second [transparent] film has a film thickness of 20 - 170 nm.

28. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 6, said first [transparent] film has a film thickness of 20 - 180 nm, and said second [transparent] film has a film thickness of 10 - 140 nm,

29. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 7, said first [transparent] film has a film thickness of 10 - 150 nm, and said second [transparent] film has a film thickness of 30 - 130 nm.

30. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 8, said first [transparent] film has a film thickness of 5 - 200 nm, and said second [transparent] film has a film thickness of 5 - 150 nm.

31. (Amended) A substrate for liquid crystal display elements as claimed in claim 24, wherein when said predetermined number is 9, said first [transparent] film has a film thickness of 5 - 200 nm, and said second [transparent] film has a film thickness of 5 - 140 nm.

32. (Twice Amended) A substrate for liquid crystal display elements as claimed in claim 1, wherein said second [transparent] film is formed of a material having a low refractive index consisting essentially of at least one compound selected from the group consisting of silicon dioxide, magnesium fluoride, calcium fluoride, and lithium fluoride.

33. (Twice Amended) A substrate for liquid crystal display elements as claimed in claim 1, wherein said second [transparent] film includes a [transparent] film located farthest from said transparent substrate, said [transparent] film being formed of silicon dioxide and having a film thickness of not less than 20 nm.

34. (Twice Amended) A substrate for liquid crystal display elements as claimed in claim 1, wherein said first [transparent] film is formed of a material having a high refractive index consisting essentially of at least one compound selected from the group consisting of titanium dioxide, zirconium dioxide, tantalum pentoxide, and tin oxide.--